

REMARKS

In the Office Action dated July 26, 2007, the drawings were objected to. Corrected drawing sheets were required. The specification was objected to because the abstract has too few words. Claims 3 and 8 were rejected under 35 U.S.C. § 112, second paragraph. Claims 1, 2, 4 and 5 were rejected under 35 U.S.C. § 102(b) as being anticipated by the Tsuchiya et al. document (Tsuchiya). Claims 3, 6 and 7 were rejected under 35 U.S.C. § 102(b) as being anticipated by or in the alternative under 35 U.S.C. § 103(a) as being obvious over Tsuchiya. Claim 8 was rejected as being unpatentable over Tsuchiya in view of Green et al. 6,353,317 (Green).

Interview

The Examiner and Primary Examiner Jackson are thanked for the courtesy of providing an interview to applicant's representatives on 18 December 2007. During the interview, the Section 112 rejections were discussed, as were the drawing objections. Also discussed was the Tsuchiya article and the Green patent. Applicant's representatives argued that the prior art as applied does not disclose the inventive silicon pillar electrode coupled with a lithium electrode to form a battery.

In view of the interview, applicant herewith cancels pending claims 1-8 without prejudice. In their place, new claims 9-24 are submitted. These claims contain the subject matter which was discussed during the interview. A discussion of the new claims follows.

Independent Claim 9 and Dependent Claims 10-20

Independent claim 9 recites an energy storage device comprising an anode

comprising an array of sub-micron silicon structures supported on a silicon substrate and a cathode comprising lithium, arranged to form a battery. It is respectfully submitted that there is no teaching or disclosure of such an energy storage device in the applied references of Tsuchiya and Green. The recitation of an energy storage device is supported in the specification on page 2, lines 6-8, for example. The anode and cathode are arranged to form a battery as is clearly illustrated in Figure 6 and discussed in the specification at page 8, lines 13-20. It is respectfully submitted that independent claim 9 patentably defines over Tsuchiya or Green individually, or their combination.

Dependent claim 10 recites that the anode is arranged to tolerate the conditions occasioned by volume changes caused by a charging/discharging of the battery. Support for this claim is found in the specification. More particularly, see the specification paragraph spanning pages 2 and 3. The subject matter of claims 11, 12 and 13 is similarly supported by that paragraph. Moreover, the subject matter of claim 14 is also supported by the specification as filed, see page 6, lines 14-16.

It is respectfully submitted that all of newly submitted dependent claims 10-14 patentably define over either Tsuchiya or Green, or their combination, as well as the remainder of the cited art.

The subject matter of dependent claims 15-19 track claims which were previously presented. More particularly, claim 15 is related to previous claim 4; claim 16 is related to previous claim 6; claim 17 is related to previous claim 7; claim 18 is related to previous claim 2; and, claim 19 is related to previous claim 3.

As a result, it is respectfully submitted that all of the dependent claims 15-19, which depend at least ultimately from claim 9, are also in condition for allowance.

Applicant submits herewith a new method claim 20. This claim recites a method

of forming an anode according to claim 9, with the method comprising depositing a film of a soluble solid onto a hydrophilic silicon substrate; exposing the film to solvent vapor so that the film reorganizes into an array of discrete hemispherical islands on the surface; and reactively ion etching the silicon substrate with the islands of highly soluble solid acting as a resist so that the exposed silicon is etched away leaving pillars corresponding to the islands. This claim tracks previous claim 5. Therefore, it is respectfully submitted that no new subject matter is being added. It is respectfully submitted that claim 20 is similarly patentable over both the applied references, as well as the remainder of the cited art.

Independent Claim 21 and its Dependent Claims 22 and 23

Applicant submits herewith a new independent claim 21. This claim recites a battery including a silicon anode comprising an array of sub-micron silicon pillars fabricated on a silicon substrate and a lithium cathode wherein a compound film is formed on the silicon pillars in a charging step. The subject matter of this claim is supported by the specification as filed. More particularly, see page 4, lines 9-24. It is respectfully submitted that there is no teaching or disclosure in either Tsuchiya or Green, or in any of the remaining cited art, of the subject matter which is recited in claim 21. Therefore, this claim is also believed to be in condition for allowance over the art of record.

Dependent claim 22 recites that the film is a Zintl-Phase compound. The subject matter is supported by the specification at page 4, lines 9-24 as noted above. It is also supported by page 4, lines 1-4 of the specification.

Dependent claim 23 recites that the compound film is deformable so as not to

give rise to significant stress induced cracking during the volume change in a charging or discharging step. This recitation is supported by the specification, particularly at page 4, lines 22-24.

It is respectfully submitted that dependent claims 22 and 23 also patentably define over the applied Tsuchiya and Green references, as well as the remainder of the cited art.

Independent Claim 24

Finally, applicant submits herewith a new independent claim 24. This claim recites an electrode for a battery comprising sub-micron silicon pillars supported on a silicon substrate and arranged to form a battery with a lithium cathode and a lithium based electrolyte. The subject matter of this claim is supported by FIGURE 6 of the application, as well as the specification on page 8, lines 13-20. As to the electrolyte, please note the specification on page 8 at lines 24-26.

It is respectfully submitted that claim 24 also patentably defines over Tsuchiya and Green, even in combination, as well as the remainder of the cited art.

Drawings

In response to the objections to the drawings, applicant submits herewith better copies of the drawings which were published in the International Application. It is respectfully submitted that these drawings should be considered acceptable by the U.S. Patent and Trademark Office as they were accepted during the International Phase of this application. However, applicant has relabeled the drawings so as to clearly indicate FIGURES 2(a), 2(c), 3(a) and 3(c).

As to the reference characters used in FIGURES 2(a) and 2(b), those deal with CV scan sets 1-10 in FIGURE 2(a) and 11-20 in FIGURE 2(b). Of course, only certain ones of the cycles are specifically identified in the FIGURES. More particularly, FIGURE 2(a) identifies cycles numbered 1, 2, 3 and 10. The other cycles are illustrated, but not specifically identified by numerals and lead lines. Similarly, in FIGURE 2(b), cycles 11, 12, 13 and 20 are identified and cycle 19 is partially identified. Applicant notes that the reference characters used in FIGURES 2(a) and 2(b) are not the same as those of FIGURES 1 and 6. A similar comment applies to FIGURE 2(c) of the drawings.

As to FIGURES 4(a) - 4(c), these figures are discussed in the specification at page 10, lines 22-27. Also, FIGURES 5(a) - 5(c) are discussed at page 11, lines 1-6.

As to FIGURE 6, it is respectfully submitted that FIGURE 6 has good contrast and is suitable for reproduction, at least in the printout of the published PCT Application No. WO 2004/042851. In the publication, FIGURE 6 is shown on sheet 1 of 11. That publication sheet is submitted herewith.

Specification

In view of the objection to the abstract, applicant submits a new abstract. It is respectfully submitted that the abstract as revised herein should be considered acceptable, as it meets the minimum wording length requirement.

Section 112 Rejections

Because claims 3 and 8 have been cancelled without prejudice, it is believed that the rejection of these claims under 35 U.S.C. § 112, second paragraph, is now moot.

In view of the foregoing, it is respectfully submitted that the pending claims, claims 9-24, are in condition for allowance. Such allowance is earnestly solicited.

Respectfully submitted,

FAY SHARPE LLP

18 Jan 2008
Date

Jay F. Moldovanyi
Jay F. Moldovanyi
Reg. No. 29,678
1100 Superior Avenue
7th Floor
Cleveland, Ohio 44114-2579
(216) 861-5582

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